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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(54) Title:</b> FAT EMULSIONS  <b>(57) Abstract</b>  Novel fat-continuous emulsion, containing a blend with emulsifying properties is obtained by the blending of: 0-90 % of a partial glyceride (=A); 0-80 % of a phospholipid (=B); 0.01-99.98 % of a long chain alcohol having > 20 C-atoms in the alcohol chain, while the amount of (A) + (B) ≥ 0.02 % and incorporating this blend in a fat-continuous emulsion.		

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## FAT EMULSIONS

Food products often contain emulsifying systems. Components  
5 for these emulsifying systems can be selected from many  
sources but often they comprise partial glycerides and  
phospholipids. Although these emulsifying systems can give  
good to acceptable results when applied in food products  
containing a fat emulsion, such as spreads, dressings,  
10 mayonnaise, creams etc we also found that product  
properties like spreadability, melt down or flavour release  
still were not optimal. This problem is known for in  
particular water-in-oil emulsions such as spreads, more  
particularly low fat spreads, wherein the emulsifier system  
15 has a critical role. This is in particular the case in  
products wherein a component is required that can provide  
structuring to the food products.  
Moreover the food products from nowadays need to contain  
components that make them healthier than the food products  
20 known so far.

Long chain alcohols are applied in food products such as  
beverages to improve stability of the beverage emulsion. (cf  
JP 63/219357). Herefore a water soluble emulsifier should  
25 be present in the composition. In this document nothing is  
disclosed about the use of these compositions in fat  
continuous emulsions let it be about the improvements in  
product properties that can be achieved by this use.  
From JP 62/224258 it is known that nutritive foods can be  
30 obtained that contain 5 out of 7 components named per se.  
One of these components is octacosanol ie a component  
comprising a long chain alcohol in high amounts. This  
document however does not disclose the use of the long

chain alcohol in fat continuous emulsions neither per se nor combined with other emulsifiers.

From JP 61/058536 nutritive food compositions are known that contain high amounts of pine nut oil and

5 polyunsaturated fatty acids such as CLA, EPA and DHA. The compositions also contain a small amount of an oil soluble, physiologically active component, which could be octacosanol (cf claim 4). Although the examples also illustrate the preparation of a margarine the margarine  
10 prepared does not contain policosanol. Therefore it cannot be derived from this document that the use of long chain alcohols in fat continuous emulsions has a beneficial effect on product performance.

We studied, whether we could find a new blend with  
15 emulsifying properties comprising also a very healthy component that provides structuring properties to fat-continuous emulsions, while also providing simultaneously cholesterol lowering properties to the food products.

Although the cholesterol lowering component per se is known  
20 for this purpose cf EP 654 262 and WO 94/07830 the positive impact of the component on the structuring properties of fat-continuous systems is not disclosed in these documents. This structuring effect is noticed as a higher hardness for the fat continuous emulsion (Stevens value).

25

Therefore our invention concerns in the first instance fat-continuous emulsions of fat and water, having a fat content of 0.5-99.5 wt%, preferably 10-90 wt%, most preferably 15-85 wt% and containing an emulsifier system, wherein the  
30 emulsifier system is a blend of components, with emulsifying properties, comprising components (A), (B) and (C), wherein:

A= a partial glyceride, containing at least one fatty acid residue with at least 2 carbon atoms

B= a phospholipid and

C= a long chain alcohol having at least 20 carbon atoms in the alcohol chain,

while (A), (B) and (C) are present in amounts, based on the total emulsifier blend of:

0-90 wt% of (A), preferably 2-60 wt %, most preferably 10-40 wt%.

0-80 wt% of (B), preferably 2-60 wt%, most preferably 10-40 wt%

0.01-99.98 wt% of (C), preferably 2-70 wt%, most preferably 10-60 wt%, and the total amount of components (A) and (B) in this blend always being at least 0.02 wt%.

In above emulsifier blends component (A) is selected from the group consisting of saturated and unsaturated monoglycerides, saturated or unsaturated or mixed diglycerides, or mixtures thereof with emulsifying properties.

Very convenient products are based on partial glycerides derived from saturated fatty acids with 2-22 carbon atoms in particular 8-18 carbon atoms, most preferably 16-18 carbon atoms. However partial glycerides based on mono or polyunsaturated fatty acid residues can be used successfully as well. In particular partial glycerides derived from oleic acid and linoleic acid perform well.

Component (B) of above blends can be selected from the group consisting of lecithin, enzymically treated lecithin, fractions of lecithin. The enzymically treated lecithin preferably is a lecithin treated with phospholipase A and/or D. Also fractions of lecithin can be used successfully eg a fraction obtained after ethanol extraction performs very good.

Component (C) is the healthy component in above emulsifier blends. This component is preferably a straight chain alcohol with more than 20 carbon atoms, in particular having 26-30 C atoms.

5 The health benefits of these components (C) are disclosed in the two documents referred to earlier. However the positive impact on the structuring properties of the blend is not disclosed therein. This component is present in a number of natural products such as wheatgerm-wax, carnauba-  
10 wax, rice bran wax and sugar cane wax. Commercial products, containing these can be obtained from eg Garuda, Int or Dalmar Lab and are known as Octacosanol®, Ateromixol®.

Thus fat-continuous emulsions of fat and water having a fat  
15 content of 0.5-99.5 wt%, preferably 10-90 wt%, most preferably 15-85 wt% and containing an emulsifier system, wherein the emulsifier system is a blend as disclosed above are part of our invention. These emulsions contain the emulsifier blend according to the invention in amounts such  
20 that the ratio fat: emulsifier blend in the emulsion ranges from 99.9:0.1 to 90:10.

Preferred fats that are applied in our emulsions are fats that display a solid fat content (measured by NMR on a non  
25 stabilised fat) at 5 °C (=N5) of >10, preferably >20 and at 35 °C (=N35) < 7, preferably <3. The solid fat content is measured on a fat that was subjected to the following T-regime: melt at 80 °C, cool to 0 °C and keep it 1 hr at 0 °C, warm up to measurement temperature and keep it at this  
30 temperature for half an hour.

Very suitable fats comprise at least two components (D) and (E) from which (D) has an N20>20 and (E) has a content mono and diunsaturated fatty acid residues of at least 25 %, preferably at least 45 %, in particular 45-70 %. Herein

component (D) can be selected from the group consisting of palm kernel fractions, palm fractions, interesterified mixtures thereof, interesterified hardened palm oil and hardened palm kernel oil and fractions thereof,  
5 interesterified mixtures of liquid oils and hardened liquid oils, and fractions thereof, fats containing at least 20 wt%, preferably at least 35 wt% of SUS triglycerides. Preferred fats D are interesterified palm oil fractions; interesterified mixtures of palm oil 58 and palm kernel 41,  
10 and its fractions, interesterified palm stearin/palm kernel stearin and its fractions and interesterified soybean oil/soybean oil 65 and its fractions.  
Component (E) suitably is selected from the group consisting of sunflower oil, high oleic sunflower oil, rape  
15 seed oil, high oleic rape seed oil, palm oil olein, corn oil, soybean oil, high oleic soybean oil.

The emulsions that are obtained are fat continuous and preferably do not contain water soluble emulsifiers, other  
20 than proteins.

The emulsions can also contain other ingredients eg proteins in particular proteins derived from milk. Another component that is useful for in particular achieving a  
25 structuring of the waterphase, in particular in those products that are low in fat content are thickeners. Useful thickeners can be selected from the group consisting of starch, modified starch, guar gum, carrageenan, locust bean gum and gelatin.



## EXAMPLES I-III

Margarines and halvarines (protein based and water based) were made according to the recipe mentioned in tables

5 I-III. The processing was performed as follows:

A premix was made at 60 °C of the components given in the amounts indicated. The premix was processed in a system consisting of an A1, an A2 and a C1 unit, wherein A1 and A2 are two scraped surface heat exchanger whereas C1 was a  
10 resting unit in case a margarine was made and an inventor in case a halverine was made.

The hardness of the products was measured on a Stevens texture analyser provided with a probe of 6.35 mm under  
15 standard conditions.

The results are given in tables I-III. It can be concluded that the products containing a policosanol were in general harder than the products without this component, although the total of (hymono + bolec + policosanol) was always  
20 0.3 %, except for the waterhalverines where this total was always 0.4 %. The results also demonstrate that the effect was bigger the more policosanol was present.

## I EFFECT of POLICOSANOL on PRODUCT PROPERTIES of MARGARINES

Fat composition:	1A	1B	1C
in (65mfPOs/35PK)	15.0	15.0	15.0
SF	85.0	85.0	85.0
Blend composition:			
Fatblend	79.55	79.55	79.55
Hymono 8903 (= MG/DG)	0.10	0.10	0.10
Bolec Z (= Lecithin)	-	0.10	0.20
Policosanol	0.20*	0.10*	-
Carotene	0.15	0.15	0.15
Whey	1.00	1.00	1.00
Salt	1.75	1.75	1.75
K-Sorbate	0.07	0.07	0.07
Water	17.18	17.18	17.18
Processing:			
Capacity k/h	5.5	5.5	5.5
A1 rpm/Tex	800/11	800/11	800/11
A2 ,,	800/8	800/8	800/8
C1 (50 ml) ,,	100/10	100/10	100/10
Pressure (bar)	2	2	2
% solids NMR	7.7	7.8	6.9
Properties:			
Stevens values (6.35 mm)			
Storage 1 week at 5°C:			
S 5	157	165	146
S 10	174	155	146
S 15	122	110	93
S 20	82	72	61
Storage 3 week at 5°C:			
S 10	195	189	159
S 20	57	44	42
Storage at 20°			
3 days at 20°C ---->S 15	116	99	84
Cycling			
3 d cycle 5°/25°C --> S 15	112	105	84

\* from Garuda Int (>95 wt% alcohols with 24-34 C atoms;  
from which 60% is C28)

Table I (cont)

Fat composition:	1D	1E	1F
in (65mfPOs/35PK)	15.0	15.0	15.0
SF	85.0	85.0	85.0
Blend composition:			
Fatblend	79.55	79.55	79.55
Hymono 8903	0.10	0.10	0.10
Bolec Z	-	0.10	0.20
Policosanol	0.20**	0.10**	-
Carotene	0.15	0.15	0.15
Whey	1.00	1.00	1.00
Salt	1.75	1.75	1.75
K-Sorbate	0.07	0.07	0.07
Water	17.13	17.18	17.18
Processing:			
Capacity k/h	5.5	5.5	5.5
A1 rpm/Tex	800/11	800/11	800/11
A2 , ,	800/3	800/8	800/8
C1 (50 ml) , ,	100/10	100/10	100/10
Pressure (bar)	2	2	2
% solids NMR	8.0	7.3	7.6
Properties:			
Stevens values (6.35 mm)			
Storage 1 week at 5°C:			
S 5	195	189	177
S 10	193	180	151
S 15	135	129	105
S 20	91	82	59
Storage 3 week at 5°C:			
S 10	212	204	168
S 20	65	55	42
Storage at 20°			
3 days at 20°C ---->S 15	107	101	87
Cycling			
3 d cycle 5°/25°C --> S 15	133	122	95

\*\* From Carnauba-wax (> 98% is C<sub>24</sub>-C<sub>34</sub> - alcohol: from which 70% is C<sub>32</sub>)

Table I (cont)

Fat composition:	1G	1H	1I
in (65mfPOs/35PK)	15.0	15.0	15.0
SF	85.0	85.0	85.0
Blend composition:			
Fatblend	79.55	79.55	79.55
Hymono 8903	0.10	0.10	0.10
Bolec Z	-	0.10	0.20
Policosanol	0.20 <sup>***</sup>	0.10 <sup>***</sup>	-
Carotene	0.15	0.15	0.15
Whey	1.00	1.00	1.00
Salt	1.75	1.75	1.75
K-Sorbate	0.07	0.07	0.07
Water	17.18	17.18	17.18
Processing:			
Capacity k/h	5.5	5.5	5.5
A1 rpm/Tex	800/11	800/11	800/11
A2 , ,	800/8	800/8	800/8
C1 (50 ml) , ,	100/10	100/10	100/10
Pressure (bar)	2	2	2
% solids NMR	8.0	7.3	7.6
Properties:			
Stevens values (6.35 mm)			
Storage 1 week at 5°C:			
S 10	155	143	143
S 15	114	94	89
S 20	79	67	54
Storage 3 week at 5°C:			
S 10	180	157	143
S 20	89	72	56
Cycling			
3 d cycle 5°/25°C --> S 15	131	98	77

\*\*\* from Sugar cane wax (97% is C<sub>26</sub>-C<sub>30</sub> alcohols, from which 62% is C<sub>28</sub> alcohol)

## II EFFECT of POLICOSANOL on PRODUCT PROPERTIES of PROTEIN HALVARINES

Fat composition:	IIA	IIB	IIC
in (65mfPOs/35PK)	17.0	17.0	17.0
SF	83.0	83.0	83.0
Blend composition:			
Fatblend	39.55	39.55	39.55
Hymono 8903	0.20	0.20	0.20
Bolec Z	-	0.05	0.10
Policosanol	0.10*	0.05*	-
Carotene	0.15	0.15	0.15
Gelatine	2.50	2.50	2.50
BMP	0.83	0.83	0.83
K-Sorbate	0.10	0.10	0.10
Salt	1.65	1.65	1.65
Water	54.92	54.92	54.92
Processing:			
Capacity k/h	5.0	5.0	7.0
A1 rpm/Tex	800/25	800/25	800/25
A2 ,,	800/8	800/8	800/8
C1 (50 ml) ,,	1650/11	1650/11	1500/10
Pressure bar	2	2	2
Properties:			
Stevens values:			
Storage 1 week at 5°C:			
S 5	140	120	110
S 10	157	153	125
S 15	110	105	93
S 20	59	53	49
Storage 3 weeks at 5°C			
S 10	161	148	138
S 20	63	-	46
Storage at 20°			
3 days at 20°C ---> S 15	84	78	78
Cycling:			
3 d cycle 5°/25°C --> S15	97	84	82

5

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\* from Garuda Int.

Table II (cont)

Fat composition:	IID	IIE	IIF
in (65mfPOs/35PK)	17.0	17.0	17.0
SF	83.0	83.0	83.0
Blend composition:			
Fatblend	39.55	39.55	39.55
Hymono 8903	0.20	0.20	0.20
Bolec Z	-	0.05	0.10
Policosanol	0.10**	0.05**	-
Carotene	0.15	0.15	0.15
Gelatine	2.50	2.50	2.50
BMP	0.83	0.83	0.83
K-Sorbate	0.10	0.10	0.10
Salt	1.65	1.65	1.65
Water	54.92	54.92	54.92
Processing:			
Capacity k/h	5.0	5.0	5.0
A1 rpm/Tex	800/25	800/25	800/25
A2 , ,	800/8	800/8	800/8
C1 (50 ml) , ,	1650/11	1650/11	1650/11
Pressure bar	2	2	2
Properties:			
Stevens values:			
Storage 1 week at 5°C:			
S 5	127	127	122
S 10	159	148	137
S 15	107	99	103
S 20	61	51	53
Storage 3 weeks at 5°C			
S 10	178	161	157
S 20	55	49	44
Storage at 20°			
3 days at 20°C ---> S 15	87	76	76
Cycling:			
3 d cycle 5°/25°C --> S15	80	91	80

\*\* from Carnauba-wax

Table II (cont)

Fat composition:	IIG	IIH	III
in (65mfPOs/35PK)	17.0	17.0	17.0
SF	83.0	83.0	83.0
Blend composition:			
Fatblend	39.55	39.55	39.55
Hymono 8903	0.20	0.20	0.20
Bolec Z	-	0.05	0.10
Policosanol	0.10 <sup>***</sup>	0.05 <sup>***</sup>	-
Carotene	0.15	0.15	0.15
Gelatine	2.50	2.50	2.50
BMP	0.83	0.83	0.83
K-Sorbate	0.10	0.10	0.10
Salt	1.65	1.65	1.65
Water	54.92	54.92	54.92
Processing:			
Capacity k/h	5.0	5.0	5.0
A1 rpm/Tex	800/25	800/25	800/25
A2 ,,	800/8	800/8	800/8
C1 (50 ml) ,,	1650/11	1650/11	1650/11
Pressure bar	2	2	2
Properties:			
Stevens values:			
Storage 1 week at 5°C:			
S 5	191	164	170
S 10	165	155	154
S 15	130	121	116
S 20	51	63	69
Storage 3 weeks at 5°C			
S 10	170	171	156
S 20	61	66	56
Storage at 20°			
3 days at 20°C ----> S 15	-	-	-
Cycling:			
3 d cycle 5°/25°C --> S15	90	91	94

\*\*\* from Ric bran wax (>98% is C<sub>24</sub>-C<sub>34</sub> alcchol, from which 78% is C<sub>28</sub>-C<sub>34</sub>)

## III POLICOSANOL IN WATERHALVARINES

Fat composition:	IIIA	IIIB	IIIC
in(65mfPOs/35PK)	17.0	17.0	17.0
SF	83.0	83.0	83.0
Blend composition:			
Fatblend	39.45	39.45	39.45
Hymono 4404	0.30	0.30	0.30
Bolec Z	-	0.05	0.10
Policosanol ***	0.10 <sup>***</sup>	0.05 <sup>***</sup>	-
Carotene	0.15	0.15	0.15
Water	60.0	60.0	60.0
Processing:			
Capacity k/h	7.0	7.0	7.0
A1 rpm/Tex	600/20	600/20	600/20
A2 ,,	600/10	600/10	600/10
C1 (50 ml) ,,	150/12	150/12	150/12
Properties:			
Stevens values:			
Storage 1 week at 5°C:			
S 5	102	92	98
S 10	123	126	114
S 15	105	107	96
S 20	71	64	57
Storage 3 weeks at 5°C			
S 10	151	139	132
S 20	65	58	52
Cycling:			
3 d cycle 5°/25°C --> S15	98	73	66

\*\*\* from Garuda Int.



## CLAIMS

1. Fat continuous emulsion of fat and water having a fat content of 0.5-99.5 wt%, preferably 10-90 wt%, most preferably 15-85 wt% and containing an emulsifier system, wherein the emulsifier system is a blend of components with emulsifying properties, comprising components (A), (B) and (C), wherein:  
A= a partial glyceride, containing at least one fatty acid residue with at least 2 carbon atoms  
B= a phospholipid and  
C= a long chain alcohol having at least 20 carbon atoms in the alcohol chain,  
while (A), (B) and (C) are present in amounts, based on the total emulsifier blend of:  
0-90 wt% of (A), preferably 2-60 wt %, most preferably 10-40 wt%.  
  
0-80 wt% of (B), preferably 2-60 wt%, most preferably 10-40 wt%  
  
0.01-99.98 wt% of (C), preferably 2-70 wt%, most preferably 10-60 wt%, and the total amount of components (A) and (B) in this blend always being at least 0.02 wt%.  
  
2. Fat continuous emulsion according to claim 1, wherein component (A) is selected from the group consisting of saturated and unsaturated monoglycerides, saturated or unsaturated or mixed diglycerides, or mixtures thereof with emulsifying properties.

3. Fat continuous emulsion according to claim 1, wherein component (B) is selected from the group consisting of lecithin, enzymically treated lecithin, fractions of lecithin.
4. Fat continuous emulsion according to claim 1, wherein component (C) is a straight chain alcohol with more than 20 carbon atoms, in particular having 26-30 C atoms.
5. Fat-continuous emulsion according to claim 1, wherein the emulsion contains the blend with the emulsifying properties in amounts such that the ratio fat: blend with emulsifying properties ranges from 99.9:0.1 to 90:10.
6. Fat-continuous emulsion according to claims 1-5, wherein the fat of the fat-continuous emulsion displays a solid fat content (measured by NMR on a non stabilised fat) at 5 °C (=N5) of >10, preferably >20 and at 35 °C (=N35) < 7, preferably <3
7. Fat-continuous emulsion according to claims 1-6, wherein the fat comprises at least two components (D) and (E) from which (D) has an N20>20 and (E) has a content mono and diunsaturated fatty acid residues of at least 25 %, preferably at least 45 %, in particular 45-70 %.
8. Fat-continuous emulsion according to claim 7, wherein component (D) is selected from the group consisting of palm fractions, interesterified hardened palm oil and hardened palm kernel oil and fractions thereof, interesterified mixtures of liquid oils and hardened

liquid oils, and fractions thereof, fats containing at least 20 wt%, preferably at least 35 wt% of SUS triglycerides.

9. Fat-continuous emulsion according to claim 7, wherein component (E) is selected from the group consisting of sunflower oil, high oleic sunflower oil, rape seed oil, high oleic rape seed oil, palm oil olein, corn oil, soybean oil, high oleic soybean oil.
10. Fat-continuous emulsion according to claim 1-9, wherein the emulsion contains > 1 wt % of a protein, in particular a milk protein.
11. Fat-continuous emulsion according to claim 1-10, wherein the emulsion contains a thickener, selected from the group consisting of starch, modified starch, guar gum, carrageenan, locust bean gum and gelatin.

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 98/02135

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A23D7/00 B01F17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 A23D B01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DATABASE WPI Section Ch. Week 8950 Derwent Publications Ltd., London, GB: Class D13, AN 89-367379 XP002073226 & JP 01 274 836 A (NIPPON OILS & FATS CO LTD) see abstract ---	1,4
A	DATABASE WPI Section Ch. Week 8618 Derwent Publications Ltd., London, GB: Class D13, AN 86-117166 XP002042067 & JP 61 058 536 A (NIPPON OILS & FATS CO LTD) cited in the application see abstract ----	1,3,4
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

International Application No  
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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 092 (C-483), 25 March 1988 & JP 62 224258 A (JUN KAWAI), 2 October 1987 cited in the application see abstract ---	1,3,4
A	DATABASE WPI Section Ch, Week 8842 Derwent Publications Ltd., London, GB; Class D13, AN 88-297717 XP002042066 & JP 63 219 357 A (NIPPON OILS & FATS CO LTD) cited in the application see abstract ---	1,4
A	EP 0 654 262 A (DALMER S A LAB) 24 May 1995 cited in the application see page 6; table 7 ---	1,4
A	WO 95 28847 A (KRAFT FOODS INC) 2 November 1995 see example 1 see claims 1,6-8 ---	1
A	GB 1 146 558 A (W.R.GRACE & CO.) 26 March 1969 see page 2, line 34 - line 52 see examples I-III see claims 1,5,8 ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 176 (C-498), 25 May 1988 & JP 62 282545 A (NIPPON OIL & FATS CO LTD), 8 December 1987 see abstract -----	1